

CLAIMS

What is claimed:

1. A programmable material consolidation system, comprising:
a fabrication site; and
a cleaning component associated with the fabrication site and including:
a material removal component for removing unconsolidated material from a substrate
upon which programmable material consolidation processes have been formed.
2. The programmable material consolidation system of claim 1, wherein the material removal component comprises a support positionable within the fabrication site.
3. The programmable material consolidation system of claim 2, wherein the support is configured to be raised to at least an upper portion of the fabrication site.
4. The programmable material consolidation system of claim 3, wherein the support is configured to rotate to facilitate removal of the unconsolidated material from the substrate.
5. The programmable material consolidation system of claim 4, wherein the support is configured to rotate at a velocity which prevents the unconsolidated material from falling into the fabrication site.
6. The programmable material consolidation system of claim 5, wherein the cleaning component further includes:
a receptacle for receiving the unconsolidated material upon removal thereof from the substrate.
7. The programmable material consolidation system of claim 6, wherein the cleaning component further includes:

a material reclamation system in communication with the receptacle and configured to return the unconsolidated material to at least one of the fabrication site and a reservoir in communication with the fabrication site.

8. The programmable material consolidation system of claim 7, wherein the material reclamation system includes:

a conduit including a first end in communication with the receptacle and a second end in communication with the fabrication site or the reservoir in communication therewith.

9. The programmable material consolidation system of claim 8, wherein the material reclamation system further includes:

at least one filter.

10. The programmable material consolidation system of claim 9, wherein the at least one filter is configured to permit the unconsolidated material to pass therethrough.

11. The programmable material consolidation system of claim 8, wherein the material reclamation system further includes:

at least one pump configured to effect movement of the unconsolidated material from the receptacle to the fabrication site or the reservoir in communication therewith.

12. The programmable material consolidation system of claim 6, wherein the cleaning component further includes:

an applicator configured to introduce at least one cleaning agent onto a surface of the substrate.

13. The programmable material consolidation system of claim 12, wherein the cleaning component further includes:

another receptacle for receiving the at least one cleaning agent and any residual unconsolidated material from the substrate.

14. The programmable material consolidation system of claim 13, wherein the another receptacle is positioned above the receptacle.

15. The programmable material consolidation system of claim 4, wherein the cleaning component further includes:

a protective cover positionable between the support and a volume of unconsolidated material within the fabrication site to prevent the unconsolidated material removed from the substrate from being directly reintroduced into the volume of unconsolidated material.

16. The programmable material consolidation system of claim 1, wherein the material removal component is external to the fabrication site.

17. The programmable material consolidation system of claim 16, wherein the material removal component comprises:

at least one material removal head.

18. The programmable material consolidation system of claim 17, wherein the at least one material removal head is configured to be oriented toward at least one surface of the substrate so as to remove unconsolidated material therefrom.

19. The programmable material consolidation system of claim 18, wherein the at least one material removal head communicates with a negative pressure source.

20. The programmable material consolidation system of claim 19, wherein the cleaning component further includes:

a material reclamation system in communication with the at least one material removal head.

21. The programmable material consolidation system of claim 20, wherein the material reclamation system is configured to return the unconsolidated material to at least one of the fabrication site and a reservoir in communication with the fabrication site.

22. The programmable material consolidation system of claim 21, wherein the material reclamation system includes:

 a conduit including a first end in communication with the at least one material removal head and a second end in communication with the fabrication site or the reservoir in communication therewith.

23. The programmable material consolidation system of claim 22, wherein the material reclamation system further includes:

 at least one filter.

24. The programmable material consolidation system of claim 23, wherein the at least one filter is configured to permit the unconsolidated material to pass therethrough.

25. The programmable material consolidation system of claim 22, wherein the material reclamation system further includes:

 at least one pump configured to effect movement of the unconsolidated material from the at least one material removal head to the fabrication site or the reservoir in communication therewith.

26. The programmable material consolidation system of claim 19, wherein the negative pressure source is adapted to apply sufficient negative pressure to the substrate to substantially remove the unconsolidated material therefrom.

27. The programmable material consolidation system of claim 18, wherein the at least one material removal head communicates with a positive pressure source.

28. The programmable material consolidation system of claim 27, wherein the at least one material removal head comprises an air knife.

29. The programmable material consolidation system of claim 27, wherein the at least one material removal head expels air or gas at a sufficient velocity to substantially remove the unconsolidated material from the substrate.

30. The programmable material consolidation system of claim 17, wherein the material removal component further comprises:

a positioning element associated with the at least one material removal head so as to position and orient the at least one material removal head at a desired location and orientation relative to the substrate.

31. The programmable material consolidation system of claim 17, wherein the material removal component comprises a plurality of material removal heads at different locations.

32. The programmable material consolidation system of claim 31, wherein the cleaning component further includes:

a support element configured to transport the substrate to each of the different locations.

33. The programmable material consolidation system of claim 16, wherein the cleaning component further includes:

a wash element associated with the material removal component and configured to remove residual unconsolidated material from the substrate.

34. The programmable material consolidation system of claim 33, wherein the wash element comprises:

an applicator configured to introduce at least one cleaning agent onto a surface of the substrate.

35. The programmable material consolidation system of claim 16, wherein the material removal component comprises:

a receptacle configured to contain a volume of at least one cleaning agent.

36. The programmable material consolidation system of claim 35, wherein the material removal component further comprises:

a carrier for at least one the substrate, the carrier positionable within the fabrication site and configured to permit the at least one cleaning agent to contact surfaces of the substrate having the unconsolidated material thereon.

37. The programmable material consolidation system of claim 36, wherein the material removal component further comprises:

an agitation system.

38. The programmable material consolidation system of claim 37, wherein the agitation system is associated with the carrier so as to cause movement of the carrier.

39. The programmable material consolidation system of claim 16, wherein the material removal component comprises:

a rotation element for causing at least one of an applicator and a carrier for at least one the substrate to spin as the applicator applies cleaning agent to the substrate.

40. The programmable material consolidation system of claim 1, wherein the cleaning component further includes:

a cleaning zone within which the substrate is positionable;
at least one source of cleaning agent; and
an applicator associated with the cleaning zone, in communication with the at least one source, and configured to introduce at least one cleaning agent onto a surface of the substrate so as to facilitate removal of residual unconsolidated material from at least one surface of the substrate.

41. The programmable material consolidation system of claim 40, wherein the cleaning component further includes:

at least one processing element for controlling operation of the applicator.

42. The programmable material consolidation system of claim 40, wherein the applicator is positioned at a fixed location relative to the cleaning zone.

43. The programmable material consolidation system of claim 40, wherein the applicator is configured to be moved to a plurality of positions relative to the cleaning zone.

44. The programmable material consolidation system of claim 43, wherein the cleaning component further includes:

at least one processing element for controlling movement of the applicator.

45. The programmable material consolidation system of claim 40, wherein the applicator comprises a spray head including at least one high pressure spray nozzle.

46. The programmable material consolidation system of claim 40, wherein the applicator comprises spray head including a plurality of high pressure spray nozzles.

47. The programmed material consolidation system of claim 40, wherein the cleaning zone is positioned over the fabrication site.

48. The programmed material consolidation system of claim 40, wherein the cleaning zone is positioned laterally adjacent to the fabrication site.

49. A programmable material consolidation system, comprising:
a fabrication site configured to contain a quantity of unconsolidated material to be selectively consolidated while at least one feature is programmable material consolidationally fabricated on a substrate within the fabrication site; and
a material reclamation system associated with the fabrication site for returning unconsolidated material recovered from the substrate following programmable material consolidation fabrication of the at least one feature thereon to at least one of the fabrication site and a reservoir in at least selective communication with the fabrication site.

50. The programmable material consolidation system of claim 49, wherein the material reclamation system is configured to transport the unconsolidated material from a material removal location to the fabrication site or the reservoir.

51. The programmable material consolidation system of claim 50, wherein the material reclamation system includes:

at least one conduit configured to effect transportation of the unconsolidated material from the removal location to the fabrication site or the reservoir.

52. The programmable material consolidation system of claim 51, wherein the material reclamation system further includes:

at least one filter positioned along the at least one conduit.

53. The programmable material consolidation system of claim 52, wherein the at least one filter is configured to permit the unconsolidated material to pass therethrough.

54. The programmable material consolidation system of claim 51, wherein the material reclamation system further includes:

at least one pump associated with the at least one conduit so as to effect movement of the unconsolidated material along at least a portion of a length of the at least one conduit.

55. The programmable material consolidation system of claim 50, wherein the material reclamation system includes:

at least one filter.

56. The programmable material consolidation system of claim 55, wherein the at least one filter is configured to permit the unconsolidated material to pass therethrough.

57. The programmable material consolidation system of claim 50, wherein the material reclamation system includes:

at least one pump configured to effect movement of the unconsolidated material from the removal location to the fabrication site or the reservoir.